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Patentanmeldung Nr. Patent application No. Demande de brevet n°

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Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:
(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
If no title is shown please refer to the description.
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Rear projection system

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Rear projection system

DESCRIPTION

The invention relates to a rear projection system comprising a rear projection cabinet with a rectangular opening, a projection screen covering said opening and a projector located at least partly in said cabinet.

5 By such a device which is known from US-A-5.289.287 an image is projected by means of the projector on the projection screen from a side remote of the side from which a person looks at the projection screen.

These kinds of projection systems are gaining interest for television and monitor applications. By such applications it is important to obtain a visible distortion free
10 image. Especially for rear projection monitor applications this is important since the projected monitor image for such application is normally a little bit smaller than the visible rear projection screen to ensure that all information of the image, like letters and numbers, is visible. Furthermore by monitor applications often straight lines are present in the image so that a distortion, for example bent lines, will be easily observable. By the projection system
15 according to the above mentioned US-patent US-A-5.289.287 a relatively expensive projector needs to be used to ensure that the projection lens system thereof cause very low distortions. However, lens systems with very low distortions are relatively expensive.

It is an object of the invention to provide a rear projection system whereby a relatively low quality, cheap projector can be used while still obtaining a visible distortion
20 free image.

The object of the invention is obtained in that the sides of the rectangular opening are curved.

By curving the sides of the rectangular opening the shape of said opening can be made the same as the shape of the image with the distortions caused by for example the
25 projection lens system of the projector. The opening is hereby adapted to the distortion instead of avoid a distortion as by the prior art systems. In such case the reference for the eye for a straight line will disappear and the distortion of the projected image seen in the opening with the curved sides becomes invisible to the human eye.

An embodiment of the rear projection system according to the invention is characterized in that the sides of the opening are curved at least as much as curvatures of sides of an image to be projected by the projector, which curvatures are due to distortion caused by the projector.

5 By giving the sides of the opening a curvature at least as much as a distorted image, it is guaranteed that the distortion of the projected image will be invisible to the human eye.

Another embodiment of the projected system according to the invention is characterized in that the sides are curved towards a centre of the opening.

10 By the normally used projection lens systems ~~with a relatively low quality~~, a distortion of the image will occur whereby the middle of each side of a projected image will be located closer to the centre of the image. By giving each side of the opening a curvature towards the centre of the opening, the distortion can be made invisible.

The rear projection system according to the invention will be explained in
15 more detail with reference to the drawings in which

fig. 1 is a diagrammatic view of a rear projection system,

fig. 2 is a front view of an opening in a cabinet of a prior art rear projection system and,

fig. 3 is a front view of an opening in a cabinet of a rear projection system
20 according to the invention.

A rear projection system 1 according to the invention includes a dockable projector 2 which can be manually inserted into a cabinet 3 for rear projection viewing. The cabinet 3 has an opening 4 in which a projection screen 5 is mounted. In the cabinet 3 two mirrors 6 and 7 are located. With the mirror 6 light coming from the projector 2 is reflected
25 upwards. With the mirror 7 light reflected by the mirror 6 is reflected forward to the rear of the rear projection screen 5. The rear projection system 1 as described above is described in more detail in the above mentioned US-patent US-A-5.289.287.

Fig. 2 shows a front view of the opening 4 and the projection screen 5 of a rear projection system according to the prior art. If by such a system the quality of the projector 2 and especially a projection lens system located in said projector 2 are of a relatively low
30 quality, an image 8 projected by means of the projector 2 on the rear side of the projection screen 5 will have the shape as shown in fig. 2 whereby edges 9, 10, 11, 12 of said image 8 are curved towards the centre of the opening 4. As can be seen in fig. 2 parts 13 of the projection screen 5 are visible between the rectangular sides 14, 15 of the opening 4 on which

no image is being projected. These parts 13 are clearly visible to the human eye and will give an impression of a distorted image.

In fig. 3 a front view of the projection system 1 according to the invention is shown in which the sides 14 of the rectangular opening 4 have a curvature with a radius R1
5 and the sides 15 of the rectangular opening 4 have curvatures with a radius R2.

It has to be noted that as well as in fig. 2 as in fig. 3 the parts 13 are relatively large and the radii R1 and R2 are relatively small to give a good impression about the problem of the prior art projection system as well as the solution provided by the rear projection system 1 according to the invention. In practise the radii R1, R2 will be much
10 larger.

When, by the rear projection system 1 according to the invention an image 8, similar to the image 8 of fig. 2 is projected on the rear side of the projection screen 5, the human eye will get an impression of a distortion free image.

The distortion can be indicated by means of a maximum percentage deviation
15 from a perfect rectangular window. By the prior art system as shown in fig. 2 the allowable distortion of the image is $< 0,5\%$ for high end monitor applications and $< 1\%$ for television with monitor as featured applications. By the system according to the invention the distortion of the image can be for example 1,5 till 3% while still having the impression of a distortion free image.

20 If the projector 2 creates an image 8 whereby the edges 9, 10, 11, 12 are curved away from the centre of the opening 4, then the edges 14, 15 of the opening 4 need to be curved accordingly.

The specific form of the opening 4 depends on the projector and more specifically on the distortions caused by the lens system of the projector of the rear projector
25 system.

Instead of a dockable projector it is also possible to mount the projector permanently and invisible in the cabinet.

CLAIMS:

1. Rear projection system comprising a rear projection cabinet with a rectangular opening, a projection screen covering said opening and a projector located at least partly in said cabinet, characterized in that the sides of the rectangular opening are curved.
- 5 2. Rear projection system according to claim 1, characterized in that the sides of the opening are curved at least as much as curvatures of sides of an image to be projected by the projector, which curvatures are due to distortion caused by the projector.
3. The rear projection system according to claim 1 or 2, characterized in that the
10 sides are curved towards a centre of the opening.

ABSTRACT:

Rear projection system comprising a rear projection cabinet with a rectangular opening, a projection screen covering said opening and a projector located at least partly in said cabinet, whereby the sides of the rectangular opening are curved. The sides of the opening are curved at least as much as curvatures of sides of an image to be projected by the projector, which curvatures are due to distortion caused by the projector.

Fig. 2

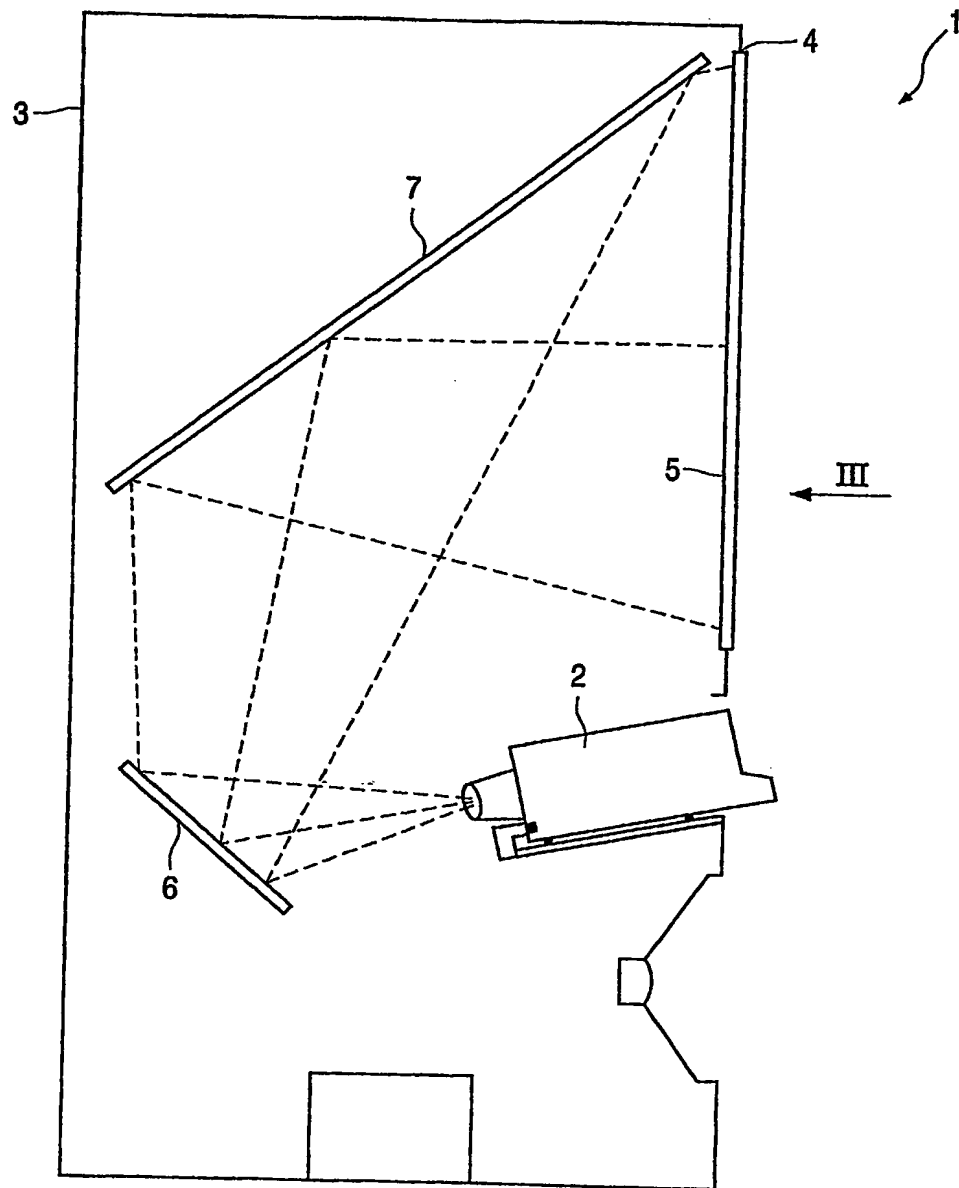


FIG. 1

2/2

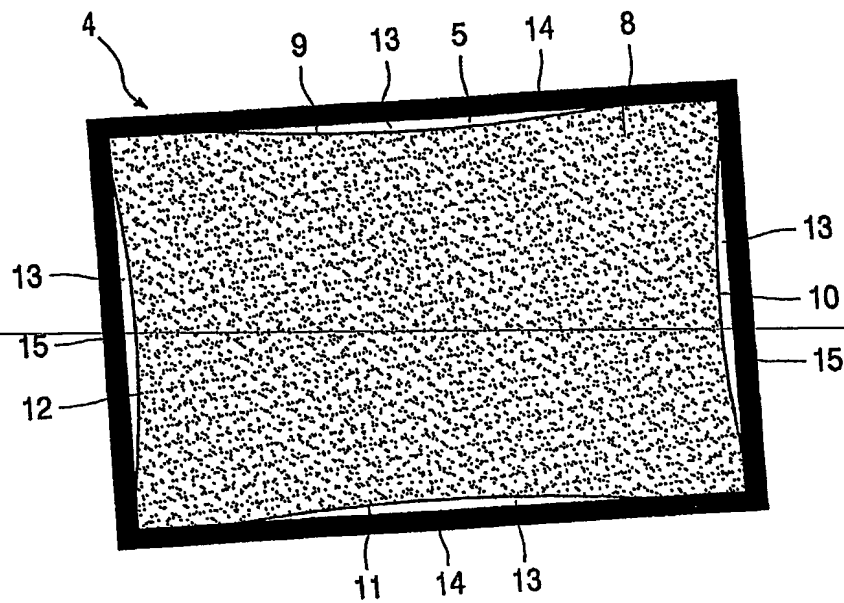


FIG. 2

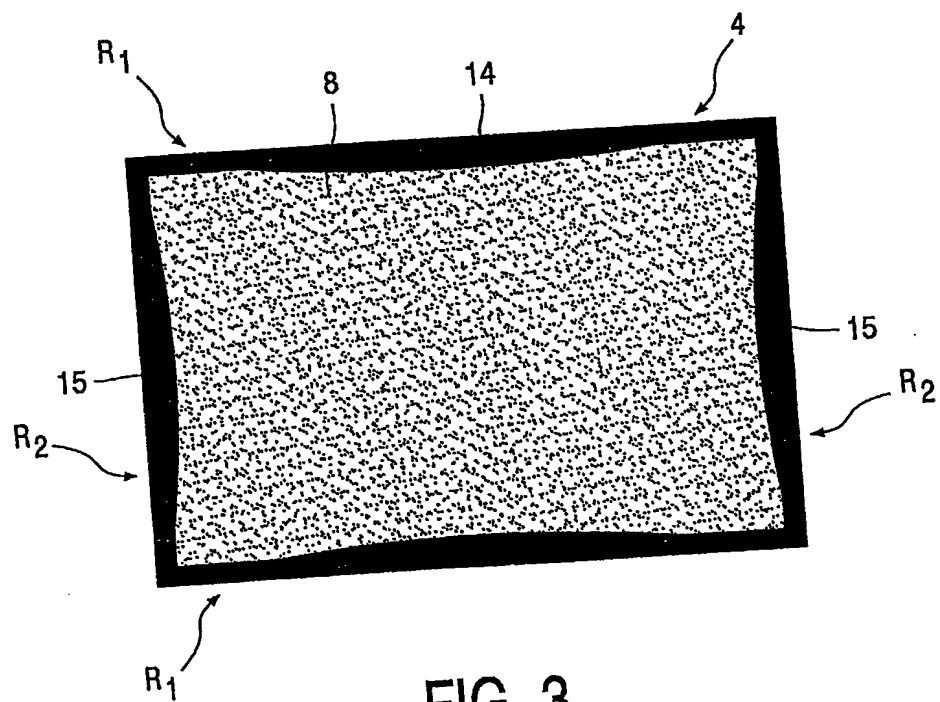


FIG. 3

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